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# BMJ Open Type and density of independent takeaway outlets: a geographical mapping study in a low socioeconomic ward, Manchester

Jennifer Blow,<sup>1</sup> Rebecca Gregg,<sup>1</sup> Ian G Davies,<sup>2</sup> Sumaiya Patel<sup>1</sup>

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<sup>1</sup>Health Professionals, Faculty of Health Psychology and Social Care, Manchester Metropolitan University, Manchester, UK

<sup>2</sup>Education, Health and Community, Liverpool John Moores University, Liverpool, UK

## Correspondence to

Dr Rebecca Gregg;  
[r.gregg@mmu.ac.uk](mailto:r.gregg@mmu.ac.uk)

## ABSTRACT

**Objectives** The socioeconomic disparity in childhood and early adult obesity prevalence has been well characterised. Takeaway outlets may cluster in lower socioeconomic areas and their proximity to schools is of concern. This study aimed to map takeaway food outlets, characterise takeaway types and their proximity to educational institutions within a low socioeconomic ward in Manchester.

**Design** The Rusholme ward and a 2 km Euclidean buffer were included as the study area. Local authority Environmental Health data were used to map the takeaway outlets, using QGIS V.2.18.0 (OPENGIS.ch LLC, Einsiedeln, Switzerland). The types of takeaway outlets and major roads were included. Number of outlets within a 400 m Euclidean walking buffer of educational institutions were mapped.

**Setting** Rusholme, Manchester, UK.

**Results** Within the study area, 202 takeaway food outlets were identified and mapped as cluster points. Of these, 62.3% are located on major (A and B) roads, while the remaining outlets were located on minor roads. The majority (57.4%) of takeaway outlets sold similar items (fried chicken, burgers, pizzas, kebabs), with the remainder offering more diverse menus. Of the 53 schools, colleges and universities within the study area, 28 (52.8%) had 1–5 takeaway food outlets within 400 m, 9 (17.0%) had 6–10 outlets; 4 (7.5%) more than 11 outlets with 12 (22.6%) having zero outlets within 400 m.

**Conclusion** Within this low socioeconomic area, there was a high concentration of takeaway food outlets, predominantly along major roads and in easy walking distance of educational establishments with the majority offering similar foods. In addition, a high proportion of these outlets were in easy walking distance of educational establishments. Public health policy needs to consider the implications of current takeaway food outlets and not just the proliferation of these outlets with current planning laws.

## INTRODUCTION

Obesity, particularly childhood obesity, and its related health consequences remain of concern to health professionals and policy-makers alike.<sup>1</sup> The socioeconomic disparity in

## Strengths and limitations of this study

- Mapping data were gathered from the public register of food businesses as the most accurate source of secondary data available next to labour intensive field work.
- This study of small independent outlets is likely to underestimate availability to takeaway meals as it did not include restaurants that provide takeaway food, mobile food units or large fast food businesses.
- The study was concentrated on a specific location and therefore limits generalisability; however, the findings will have resonance to other similar areas.
- This was a cross-sectional analysis of takeaway availability and location of educational establishment and cannot provide causal links between their proximity and food intake.
- As the study categorised all education establishments together, it was unable to distinguish between takeaway outlets proximity to primary and secondary schools separately.

the prevalence of childhood and early adult obesity are well characterised,<sup>2</sup> and a greater focus on the food environment is needed to understand the socioeconomic differences.

The current study was based in Manchester, which is placed on the top 20% of the most deprived unitary authorities in England. In Manchester, the prevalence of obesity in schoolchildren aged 10–11 is 25.1%, above the national average of 19.8%.<sup>3</sup> Manchester has also been ranked as having one of the highest takeaway outlet density per 100 000 people in England.<sup>4</sup> Within Manchester, the Rusholme ward was selected, as it is a socially deprived centrally located ward, consisting of a major roads and public transport network.

Currently, 21% of children and adults in a UK-based survey of 2001 adults and 1963 children reported eating takeaway meals at home once per week or more.<sup>5</sup> These foods are characterised with a poor nutritional profile representing a risk of non-communicable

disease such as diabetes and certain cancers.<sup>6</sup> This risk factor for nutrition-related illness is compounded further with the tendency of takeaway outlets to cluster in lower socioeconomic areas.<sup>7</sup> Living in an area populated with high numbers of takeaway establishments is associated with a higher consumption, particularly in deprived areas, and therefore prevalence of obesity.<sup>7-9</sup> Particularly of concern is their proximity to schools<sup>10</sup> and thus the physical food environment that children are exposed to; thus, current planning laws are aiming to restrict the opening of new takeaway outlets within 400 m of schools.<sup>11</sup>

In 2017, the Centre for Diet and Activity Research (CEDAR) and the Medical research Council (MRC) Epidemiology Unit at the University of Cambridge developed the food environment assessment tool (<http://www.feat-tool.org.uk/>) which aims to map and monitor neighbourhood food choice and health. This includes supermarkets, cafes, restaurants and takeaways; which include bakeries, fast food chains and independent takeaway outlets. However, it does not provide information on the type of food sold, type of outlet or a characterisation of the takeaway outlet landscape. Moreover, Miura *et al*<sup>12</sup> suggested that inconsistent evidence related to socioeconomic position and takeaway food purchases was due to varied definitions of takeaway foods, highlighting the importance of clear definition.

This study aimed to map takeaway food outlets, defined as small, independent outlets offering convenience hot meals, as opposed to fast food outlet chains. In addition, this study aimed to categorise the type of food sold and the proximity of takeaway food outlets to schools, colleges and universities in order to characterise the physical takeaway food environment within a low socioeconomic ward in Manchester. In characterising the food environment, the research aimed to inform public health policy regarding the planning and proliferation of takeaway outlets, alongside a clear picture of types of cuisine provided and their accessibility to those attending educational establishments.

## METHODS

### Study ward description

The present study was conducted in the electoral ward, Rusholme, that is situated within the city and metropolitan borough of Manchester, Greater Manchester, England.

Rusholme is a predominantly residential electoral ward, two miles south of Manchester city centre. Electoral wards are spatial units in UK administrative geography used for the purpose of electing local government councillors.<sup>13</sup> Rusholme covers a relatively small area of 198 hectares, but is densely populated with a count of 14 300 residents, or 72.2 residents per hectare, among the most densely populated wards in Manchester.<sup>14</sup> Rusholme also accommodates a large population of South Asian residents, the majority of which are of Pakistani and Bangladeshi ethnicity.<sup>15</sup> The proportion of South Asians in Rusholme

is 39.9% compared with the Manchester wide proportion of 17.1%.<sup>15</sup> Within this ward, Wilmslow Road comprised many South Asian restaurants and takeaway establishments, aptly nicknamed the 'Curry Mile' in the mid-1980s.

### Study area definition

A 2 km Euclidean (straight-line) radius buffer area surrounding Rusholme's ward boundary was selected as the study area. Use of a Euclidean radius buffer is appropriate in relatively small areas, such as the area under study.<sup>16</sup> The buffer distance of 2 km was intended to represent a conceivable travel (by means of walking or otherwise) or takeaway delivery distance for residents to obtain takeaway food within their home neighbourhood.

### Takeaway food outlet definition

Takeaway food was defined as convenience and fast food meals purchased from small, independent outlets, that are commercially prepared and ready for immediate consumption, either eaten in-store or elsewhere, or ordered for delivery. A similar definition has previously been used in another UK-based takeaway food study.<sup>17</sup>

### Data collection

#### Patient and public involvement

Patients nor the public were involved in this geographical mapping study; however, these results will be disseminated during a community engagement event.

#### Takeaway food outlet data

As the aim of the present research is to map takeaway food outlets in the area, only the food businesses categorised as 'takeaways' were used for geographical mapping. In this study, we have used a source of secondary data to identify takeaway outlets in the study area.<sup>18 19</sup> UK food businesses are required by law to register with their local council.<sup>20</sup> The type of food business that the premises is registered as depends on its use according to The Town and Country Planning (Use Classes) Order (1987), where takeaway food outlets are registered as 'A5 Hot food takeaways - For the sale of hot food for consumption off the premises'. Under the Freedom of Information Act (2000), local councils are subsequently required to provide an up-to-date list of business names, addresses and use and class types of all food premises that are located within their jurisdiction. The most recent public register of food premises at the time of data collection (April 2016) was provided by the Environmental Health Department of Manchester City Council. This list was updated on a monthly basis. Some address data were absent from the public register; therefore, Google Maps (Google, California, USA) or food business websites or local directory webpages such as Yell.com (hibu (UK), Reading, UK) were used to find any missing addresses.

The Environmental Health Department categorise takeaway food businesses such as kebab shops, chip shops and pizza outlets as 'takeaways' for the purpose of the public register; however, food businesses that have more than a small number of tables (this was not quantified)

and that also provide a takeaway service are placed into the 'restaurant/café/canteen' category and subsequently not included in our study. There was a further category of 'mobile food units'; mobile takeaways were not included in the present study as their location could not be ascertained (more than 35%).

### Population data

#### Identification of education institutions

Ordnance Survey Points of Interest data<sup>21</sup> were used to identify educational institutions (Category 31 'Primary, secondary and tertiary education'). The data file used for this information was the Ordnance Survey Points of Interest (Shapefile geospatial data), which covered the Manchester District, Updated March 2016, (Ordnance Survey, GB. Using: EDINA Digimap Ordnance Survey Service, <http://edina.ac.uk/digimap>, Downloaded: April 2016). These data are used by government and according to Ordnance Survey, it is the most comprehensive, up-to-date, location-based directory of all publicly and privately owned businesses, including educational institutions. Moreover, as these data are pre-geocoded to a building centroid, they are very spatially accurate.

### Data analysis

The geographic information system (GIS) software, QGIS V.2.18.0 (OPENGIS.ch LLC, Einsiedeln, Switzerland), was used for geographical representation and analysis in the present study. Each data variable was input into the GIS software and used to visually represent the location of these data. Index of multiple deprivation data were represented as thematic maps by Lower Layer Super Output Area (LSOA). Takeaway outlet address data were geocoded using postcode centroids and visually represented as data points on an existing map of the study area. Major roads (A and B roads) were also highlighted in order to aid description of the location of large clusters of takeaway food outlets.

Takeaway food outlets were sorted into cuisine types in order to describe the types of takeaway food that are available in the area. These data were based on the food menus located either on the business websites, internet-based takeaway ordering service websites, or by telephoning the business and requesting information about the menu.

Educational institutions including only schools, colleges and universities (and not adult learning facilities) were identified and visually represented on a map. The GIS software was used to place a 400 m Euclidean radius buffer distance around each institution and subsequently quantify the number of takeaway outlets located inside each buffer. This distance was selected to represent a conceivable walking distance for students to travel during breaks (if the institution is not gated) or while travelling to or from the institution and thus reflected in the hot food takeaway planning policy of Manchester City Council.<sup>11</sup> This distance is often used on the basis that the average adult is able to walk approximately 400 m in 5 min.<sup>22</sup>

We have completed the Geo-FERN checklist for the reporting of food retail outlets, which supports the clear and comprehensive reporting in this field.<sup>23</sup>

### RESULTS

The total area under study measured 27.04 km<sup>2</sup>, covering 22.2% of Manchester city, and included several wards (see online supplementary figure S1). Of the 114 LSOAs that are located within the study area, 88 (77.2%) placed in the most deprived tertile, 20 (17.5%) placed in the intermediate tertile and 6 (5.3%) placed in the least deprived tertile in England (see online supplementary figure S2).

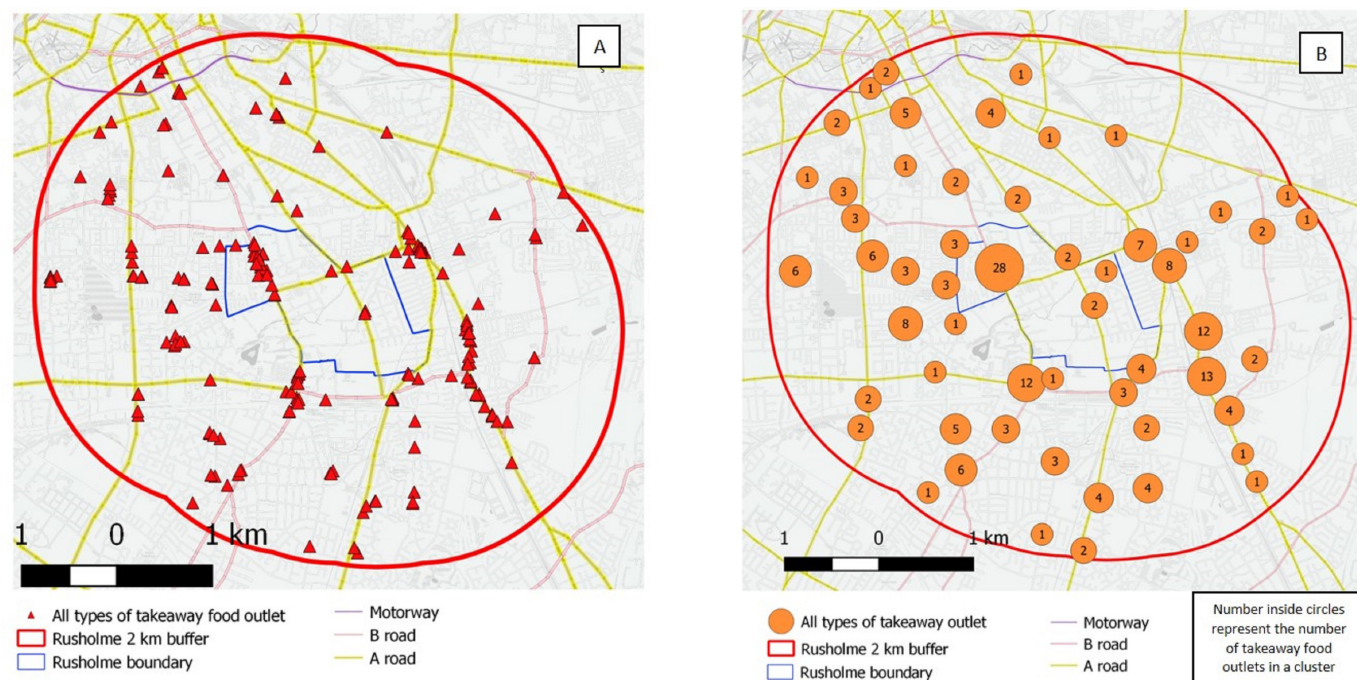
A total of 202 takeaway food outlets were identified and mapped within the study area. Figure 1A represents a map of the study area displaying each takeaway food outlet as a point located at the address provided within the public register. Figure 1B represents a map of the study area with the takeaway food outlets presented as 'cluster points' as some takeaway outlets are in very close proximity. The number and size of each point on the map represents the number of takeaway outlets that cluster within a small area. Of these 202 takeaway food outlets, 136 (62.3%) are located on major roads (A and B roads), while the remaining 66 (32.7%) are located on other minor roads, these results are displayed as counts in a heat map in figure 2.

Four cuisine types were created based on the most commonly occurring types of cuisine in the identified outlets. The categories were: 'mixed cuisine' (57.4%) (including outlets that sold combinations of predominantly fried chicken, burgers, pizzas, kebabs, deep-fried fish and chips; some of which had small quantities of other types of cuisine available on the menu); 'other specialist cuisine' (16.3%) (including outlets that sold only Chinese, Japanese, Thai, Caribbean, Spanish or Greek cuisines); 'English and Chinese cuisine' (15.3%) (including traditional English fish and chip shops only or in combination with Chinese cuisine); and 'South Asian/Arabic/Turkish cuisines' (10.9%) (including outlets that sold these cuisines only). No other cuisine types were identified within the study area.

Figure 3 represents the cuisine types as clusters within the study area, where the size of the cluster represents the number of takeaway outlets. All types of outlet were observed more frequently on major roads (A and B roads), except for the 'English and Chinese cuisine' type which was observed more frequently on minor roads.

Of the 53 schools, colleges and universities within the study area, 28 (52.8%) had 1–5 takeaway food outlets within 400 m, 9 (17.0%) had 6–10 outlets; 4 (7.5%) had more than 11 outlets with 12 (22.6%) having zero outlets. Figure 4 displays a map of the locations of the education institutions in conjunction with 400 m Euclidean buffers; the number represents the number of takeaway food outlets that were identified within its corresponding 400 m buffer.





**Figure 1** Map of takeaway food outlets in the Rusholme +2 km buffer area, A as individual points; B as clusters. Crown copyright Ordnance Survey. All rights reserved.

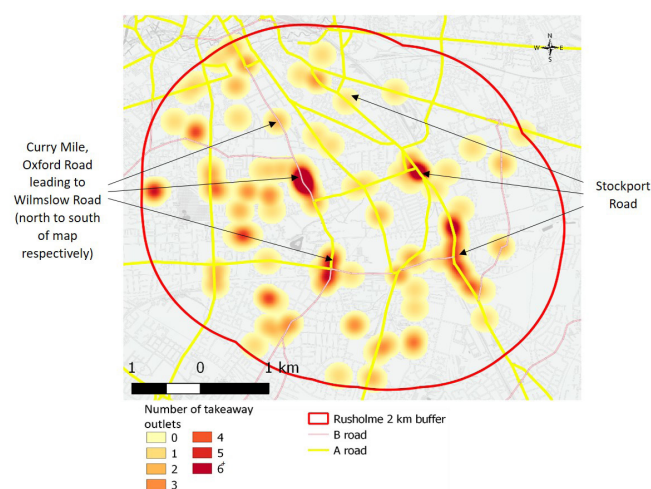
## DISCUSSION

The present study shows that within a low socioeconomic ward of Manchester, there is a high number of takeaway outlets. The majority of these outlets offered a mixture of fried chicken, burgers, pizzas, kebabs along with a small number of other menu items, often located on major A and B roads. Of the 53 schools, colleges and universities located in the study area, over half had between one and five takeaway outlets within a 400 m walking distance.

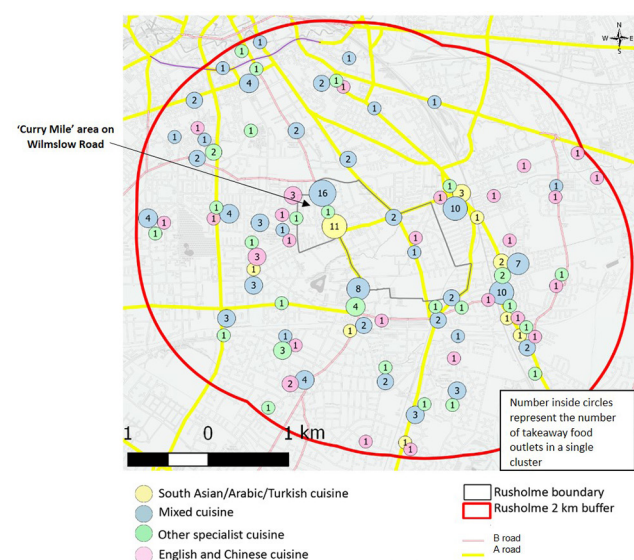
Previous studies in the UK<sup>24 25</sup> and US<sup>26</sup> have reported takeaway and fast food outlets being most concentrated in commercial streets within low-income areas. MacDonald *et al.*<sup>24</sup> attribute their findings to the possibility

of low-income areas being more commercially desirable to fast food businesses due to cheaper or more available land, higher consumer demand or ease of obtaining planning permission. The findings here are consistent with these results showing a high number of takeaway outlets within a socioeconomically deprived area.

In this study, we have concentrated on a narrow definition of takeaway food outlets, to small independent outlets providing hot convenience foods and distance to fast food outlets (chains), cafes and restaurants as classified by Lake *et al.*<sup>18</sup> There has been a paucity of research



**Figure 2** Heat map showing the number of takeaway outlets against major roads within the Rusholme +2 km buffer study area. Crown copyright Ordnance Survey. All rights reserved.



**Figure 3** Map of categorised takeaway outlets by cluster within the Rusholme +2 km buffer area. Crown copyright Ordnance Survey. All rights reserved.



**Figure 4** Map of all schools, colleges and universities with 400m Euclidean buffers for takeaway food outlets in the Rusholme +2 km buffer area. Crown copyright Ordnance Survey. All rights reserved.

concentrating on takeaway food outlets, with many concentrating on fast food outlets and lacking the ability to distinguish the two types when classifying the food-scape. In addition, this study concentrated on takeaway outlets due to the lack of nutritional labelling specifically within the independent (small business) outlets. Under the now discontinued Responsibility Deal, most fast food chains and other out-of-home foods provided energy and nutrition information.

Additionally, in a qualitative study with takeaway outlet owners in Tower Hamlets, London,<sup>25</sup> ethnic minority areas were found to be attractive to ethnic minority entrepreneurs for the cheap and abundant supply of workforce residing close by, low rent and the ability to cater for their local community's consumption habits, including culturally/religiously acceptable foods. Tower Hamlets is comparable to the present study area, both being characterised by a large ethnic minority, with low-income communities and a high concentration of takeaway outlets.

Large commercial areas create a sense of community focus and vitality for such communities,<sup>27</sup> which could be attributed to the Wilmslow Road or Stockport Road commercial streets within the current study area. The findings in the current study show that there is likely to be high demand for both traditional ethnic cuisine and takeaway food by the ethnic minority and student community that co-reside there, which would explain their ability to generate revenue and financially survive among dense competition. This is supported by the findings of our qualitative study within the same study area that showed the value of routine traditions linked with takeaway food consumption alongside the importance of cultural acceptance. Moreover, both the A and B roads are central commuting routes that are characterised by a high footfall, which is a key revenue-building tactic, and thus, it is no coincidence that they are positioned on such routes.

The takeaway outlets identified in the study area were further organised into types of cuisine. Olsen *et al*<sup>28</sup> previously identified that fast and takeaway food providers are devoted to the provision of standardised, routinised food for a uniform meal experience and often use the same suppliers for pre-prepared food. Furthermore, this popularised American-style cuisine, which was a main category of takeaway outlets in the study area, is a proven success in global brands such as McDonalds, KFC or Domino's, both in terms of customer popularity and cheaper ingredients for increased revenue.<sup>29</sup> Bagwell<sup>25</sup> identified that outlet owners in Tower Hamlets had previously offered Asian foods only; however, due to fierce competition and economic recession, customers were seeking cheaper food and thus changing the type of takeaway food provided.

Not only is there known to be a socioeconomic disparity in childhood and adult obesity along with other adverse health outcomes, but people from Indian, Pakistani, Bangladeshi and Afro-Caribbean ethnic minorities have a higher prevalence of obesity, type 2 diabetes and cardiovascular disease.<sup>30</sup> Similarly, these ethnic minorities have higher prevalence of childhood obesity and lower levels of physical activity.<sup>31–33</sup> Exposure to outlets in neighbourhoods, along commuting routes, and in work environments has been associated with higher takeaway food consumption and prevalence of obesity.<sup>34</sup> Thus, it could be postulated that improving the food environment could be one of the methods to reducing obesity rates.<sup>35</sup>

The quantity of takeaway outlets within a 400m Euclidean buffer radius of each school, college and university was identified. Previous UK-based studies have identified that school children use takeaway outlets during lunchtime and after school,<sup>36</sup> and although the takeaway food environment has been associated with adult obesity,<sup>34</sup> there is limited research regarding school food environments.<sup>37</sup> A study of food outlets within a 400m zone of primary schools in Newcastle showed that the total number of food outlets (predominantly convenience shops or takeaways) were higher for schools in more deprived areas and with above average child obesity rates.<sup>10</sup>

Planning laws that restrict the proliferation of outlets near schools will not affect those that are already open near 69.8% of the schools, colleges and universities found in this study. It is evident that public health policy needs to consider how to curb the impact of established takeaway outlets in order to have a positive impact of health of children and the wider population. Moreover, our research suggests that the majority of these takeaway outlets provide a similar menu type, and it could be that the provision of food items could be targeted either by supporting reformulation of food items or improving the provision of healthy choices.<sup>6</sup> Indeed, this would require the support of business owners but also the community and stakeholders.



## Strengths and limitations

Previously, researchers who have mapped food businesses have used commercial sources, local directories and omnidirectional imagery (eg, Google Street View).<sup>19 38</sup> However, these sources have been shown to have low accuracy.<sup>18</sup> The use of the public register has been shown to be a most accurate secondary data source<sup>39</sup> with the secondary use of multiple sources being ideal.<sup>18</sup> Only the collection of primary data through field verification would produce a completely accurate data set; however, this method is particularly labour-intensive and time-consuming. The analysis of small, independent outlets in this study is likely to underestimate the availability of fast and takeaway foods, as it has not considered restaurants that provide takeaway food, mobile food units or large fast food businesses.

This study has concentrated on a specific low socioeconomic ward and its surrounding area for its study area and thus limited to this location. However, the final study area included a large geographic area and population, and thus, similarities to other areas could be drawn. Evidently, this study characterised a cross-sectional map of takeaway outlet clustering and cannot provide any causal relationship, for example, between education institutes and takeaway proximity.<sup>40</sup>

A major limitation of this current study is that that educational institutions have not been further divided into primary or secondary schools, and further and higher education institutes. It could be suggested that this limits the utility of the results; however, the majority of education establishments identified will be primary and secondary schools with only a small number being further and higher education establishments. Notably, this work did not simply aim to only map the takeaway outlet landscape within the study area but to also focus on cuisine types along with their location and clustering. This aspect of the work is unique as it highlights how the majority of takeaway outlets provide similar food types.

## CONCLUSION

The majority of takeaway outlets within the study area offered similar menu items, with the majority being on major commercial roads. The high number of takeaway outlets near education institutions provides a physical food environment characterised with unhealthy choices that children and young adults are exposed to. Not only does the proliferation of takeaway outlets need a flexible public health approach, but also how the provision of existing takeaway outlets could be improved. Any public health policy would need to take into consideration the beneficial role these takeaway outlets play with respect to culture and community while reducing exposure to children and young adults to ensure policies are successful.

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**Data sharing statement** Extra data are available by emailing jennyblow1@outlook.com

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